SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 1784.—Vol. XXXIX. LONDON, SATURDAY, OCTOBER 30, 1869. {STAMPED .. SIXPENCE. UNSTAMPED. FIVEPENCE.

Original Correspondence.

THE THORNCLIFFE DISPUTE.

SIR,—At the earnest request of many friends, we beg to submit the following statement for the information of the public as to the real position of affairs in this neighbourhood. Our pits have been opened since March 24, for the employment of colliers who will agree to the following terms :—

1.—That they will work according to the rules and bye-laws in force at our collieries at the time of their engagement. (Those now in use have not been altered since 1866.)

2.—That they will give eight hours of labour every day when required.

3.—That they will each negotiate separately with us or our agents for the price to be paid for their labour from time to time.

4.—That they will be members of the Thorncliffe Accident Club, to be managed by a committee of the workmen in conjunction with the masters.

5.—That every householder shall have coal of any description for his own use at 5d. per ton below the market price.

Upon these terms a number of men are now working for us, but the acts of violence which have been committed, and the intimidation which is constantly brought to bear upon them, have necessitated our keeping a large force of police (numbering now twenty men) constantly on duty to guard them. The whole neighbourhood is in a state of constant terror, and no collier, or his wife, or child can safely leave our premises without an escort of police. The occurrences of yesterday afternoon are sufficient proof of this. A mob of about 70 colliers (quite strangers to the neighbourhood), armed with rough sticks, made their appearance at the cottages at Thorncliffe, where our colliers at present reside; they took off their coats and used threatening language, but upon the appearance of the police they went off to High Green. Here very large numbers were assembled, and accompanied them to our cottages at Westwood. At the same time about 200 colliers were assembled at Hoyland Common and Birdwell, which are within a short distance of Tankersley Pit, so that it is quite clear a preconcerted attack upon our property was intended. We have had information of this intention for the last ten days, and have had communications with the magistrates and the Home Office, with a view to the preservation of the peace. We are thankful to say that the vigorous measures adopted yesterday had the effect of preventing actual damage being done.

The subject of wages is not one which can be discussed in these columns, but we may just say that the prices we pay are such that every ordinary workmen can earn as much (if not more) wages as at any other colliery in this district; and it is well known that wages in South Yorkshire are higher than in any other part of the country.

We do not intend to enter into any newspaper controversy, nor to answer any statements which may be made contrary to the above facts, which can be abundantly proved to all unprejudiced persons.

NEWTON, CHAMBERS, AND CO.

Thorncliffe Iron Works, Oct. 22.

EXPERIMENTS WITH SAFETY-LAMPS.

SIR,—I am much surprised to find that the late experiments conducted at Hetton Colliery, and reported in the *Mining Journal* of Oct. 16, are said to have been unsatisfactory; the general impression was that they were not only highly important, but eminently satisfactory. It really appears to be a very odd circumstance, as Mr. Hann observes, that "The experiments of the Committee are worthy of all confidence, having been conducted with the greatest possible care, and very many times repeated." This was exactly our view of the case, and hence the results of the late trials, conducted by the colliery officials, and with the same means and appliances, excited surprise and curiosity in the highest degree. It must be noticed also that the trials were not conducted hastily, but extended over several hours. However, we have merely published the official account of those trials, and the parties who conducted them are responsible for their accuracy; and we shall continue to place the most implicit confidence in them until they are upset by further trials. So far as we are aware, the Springwell-Stephenson does not differ in any essential part of its construction—that is, as far as safety is concerned—from the ordinary Stephenson in common use; therefore, when we attempt to show that the Stephenson lamp is a perfectly safe and reliable one, we mean the Stephenson in general use; and, were it not for its clumsiness and heavy weight, we would not object to take the Stephenson in common use in the year 1832 and subject it to any trials it is possible to suggest—that is, in ordinary working practice.

It is not desirable that just fears and apprehensions should be lulled to sleep, but, at the same time, it is equally absurd to indulge and encourage groundless alarm, and it is positively sickening to observe the sweeping assertions that have been made of late respecting the danger of using lamps, &c. Mr. Hann says that "we have had at least five such cases during the last five years—Jane Pit (Houghton), Cwmammon, Pelton Fell, Monterrard, and Ferndale! What does he mean? Has the poor Davy lamp to be answerable for those disasters? It is really utterly absurd; if, however, he will show any proof or ground whatever for this conclusion, we shall be glad to read it carefully. What occurred at the Jane Pit, Houghton, if we recollect rightly, has some bearing on the subject, and it was a very peculiar circumstance, which bears out what we said about the Davy lamp. But the explosions at the other places were never, so far as we are aware, even attributed to the failure of the Davy lamp. Imperfect ventilation, or the incautious use of gunpowder, has been, without doubt, the cause of all modern explosions, and not the failure of the safety-lamps in use.

And now with respect to the Stephenson lamp, it has been used in the most fiery collieries in this kingdom during the last *thirty years* daily, and has any explosion ever occurred from it? Certainly not, that we are aware of; there has, indeed, never been, so far as we know, such a charge made against it, and, therefore, we do not see how we err in looking at the daily work of this lamp, and the results of many years' experience with it, and placing those results and experience against the results arrived at by placing the lamp in a box, where a certain mixture of air and *manufactured gas* is admitted. With respect to blowers, and mixtures of gas propelled by falls of roof, the Stephenson lamp has been exposed to those things in very many cases, and the only result has been that the lamp has been extinguished. It has frequently happened that heavy falls have occurred, and forced a large quantity of gas into the working places where men have been working with this lamp, and the consequence has been that the lamps have been extinguished, and the men left in darkness; and the lamp has been objected to by some mining engineers on this account, they do not approve of the men being left in darkness. With respect to blowers, where a considerable quantity of gas is given off they are approached very cautiously (if at all), and the effect is generally that the lamp is extinguished, and there is an end to the matter.

Mr. Hann says that "With velocities of 15 to 20 ft. per second a very imperfect mixture of gas and air will explode a Davy, a Stephenson, or other lamp," &c. But where are we to get such a velocity, and such a mixture as Mr. Hann has in his box to mix with such a current in the workings of a mine? The speed necessary to explode the lamps, and the mixture required, is not met with in mines: the results of the most extended practice with lamps in this and other countries sufficiently proves this position. M. E.

SAFETY-LAMP EXPERIMENTS.

SIR,—Such experiments as those at the Hetton Colliery, to which reference is made in the Journal of Oct. 16, are, no doubt, interesting, but the great question is whether they are of any real practical value. The circumstances under which the lamps have been tested are such as are never likely to exist in mines, so that if the lamps really represented an average sample of the several kinds but little reliance could be placed upon the results obtained, because whilst those interested in one lamp may possess facilities for having a specially constructed lamp, another may labour under the disadvantage of having a lamp taken which has been long in use, and, perhaps, subjected to all kinds of rough usage. In the *Mining Journal* of Nov. 23, 1867, your well-known correspondent, "M. E.," very truly remarks that the assertions of those who at once rush into such statements as this—"that the Davy, Clanny, Mueseler, Stephenson, and other safety-lamps in universal use are, in the varying circumstances of a dangerous mine, quite unworthy of the name," are not at all warranted by the results of the said experiments. Nearly the whole question hinges on this part of the above quotation—"the varying circumstances of a dangerous mine," as the experiments alluded to are conducted under conditions which do not obtain usually in mines, and it is a question fairly open to discussion whether these conditions ever occur in mines at all. Your correspondent, "M. E.," after expressing these views, refers to the statements and tables published by the manufacturers of Morison's lamps to show the absurdity of the conclusions drawn from the experiments. He shows that, assuming such currents as those mentioned to exist, it would be most improbable that sufficient gas could be liberated to render them explosive, and that if the velocity of the current be lower the lamps declared to be dangerous would be proportionably safe.

This opinion is, in a great measure, borne out by the record of experiments published in the Journal of Oct. 16, especially the series in which the velocity of the current was limited to 8 ft. per second—the Davy alone exploded, all the others tried going out in a few seconds. The Springwell-Stephenson, Grey's Clanny, the ordinary Clanny, and Hann's lamps were amongst those tested, and all went through the ordeal with equal success. The same results were shown at higher velocities, but as such speeds as 34½ ft. per second and 38½ ft. per second are unlikely to be met with in mines, it is unnecessary to refer to them. That the Davy lamp will explode in a very moderate current appears to be pretty well established, although it is questionable whether even a Davy lamp, if very carefully constructed, would not bear the test. With regard to the other lamps, they seem to be, practically speaking, quite safe, so that a Stephenson or a Clanny, purchased of a reliable maker, may be thoroughly relied upon. The experiments, however, are not entirely without value, for they enable the practical man to judge which lamps are materially defective, and give him confidence to introduce those lamps which have often been objected to as unsafe, although affording such a largely increased amount of light that the inducement offered to colliers to open their lamps is much diminished.

Oct. 26. COLLIER.

IRONWORKS, AND COAL MINING IN MONMOUTHSHIRE.

THE BLAENAVON WORKS.

SIR,—The iron works are situated at the head of the Avon, and near the terminus of the eastern valley branch of the Monmouthshire Railway. The works were established in 1789, by Mr. Thomas Hill and Mr. Samuel Hopkins. A canal was first made to the works from Newport about the year 1802; but this has been filled up between Pontypool and Blaenavon—a distance of six miles—and the Monmouthshire Railway was made on the same track in the year 1852.

BLAST-FURNACES.—There are six furnaces at the old works, 48 ft. high, five of these now in blast; they are all blown with cold air. The furnaces are open at the top, but an iron hopper is placed in each, which collects part of the gas; this gas is utilised in heating the blast-engine boilers. At the top of the blast-furnaces there are extensive coke yards for coking in clamps; this coke is used in conjunction with cold blast. There are also coke-ovens, in some the coke is drawn by crabs, others by hand. This coke is used in conjunction with hot blast. There are also extensive kilns for calcining Welsh mine. One blast-engine (built 1819) of the beam construction, 104-in. blowing cylinder, with 8-ft. stroke, and going 12 strokes per minute, would blow 11,184 cubic feet. The other blast-engines are two 90-in. blowing cylinders horizontal, 7-ft. stroke, connected together to one fly-wheel; pillar of blast, 3¾ lbs.; this engine is capable of blowing 14,830 cubic feet per minute, at 12 strokes; it blows to three furnaces. There are seven boilers to each engine. The gas is insufficient for heating the whole. There are three blast-furnaces at the new works, 50 ft. high, 15-ft. bosh, all in operation; the last of these blown-in was in June, 1868. These are closed at the top with the cup and bell, and the gases utilised for heating the blast-pipes and boilers. Hot air is blown, and the make of each varies from 180 tons per week of grey iron to 300 tons of forge pig-iron. The blast-engine is of the beam construction, the beam extending over the cylinder to the connecting-rod of the fly-wheel. The blowing cylinder is 10-ft. diameter, 10-ft. stroke, and is capable at 12 strokes of blowing 18,840 cubic feet per minute. There are 72 coke-ovens erected behind the top of the furnaces; the coke is drawn by travelling crab and rails. They are built in two double rows, with flues, and a high chimney to each double row.

FORGES AND ROLLING-MILLS.—There are 72 puddling-furnaces. These supply four forge trains, all driven by one engine. There are three large steam-hammers for separating the dross in the puddle balls. Boilers are placed horizontally over several of the furnaces for generating steam, two furnaces to one boiler. There are a few stack boilers. There are 25 balling-furnaces, and five rolling-mills. One large beam-engine drives the rail-mill and a mill for merchant iron, on one side, and a roughing-down mill on the other side; one horizontal cylinder engine drives a blooming-mill; and one small engine drives a guide-mill; one engine for each saw, one engine for two puddle bar shears, and one for large shears; one works three double presses, and one engine each to the punches. The make of finished iron is about 850 tons per week; about 5-6ths of this will be in rails and railway iron. The quality of the rails varies greatly, a part being made altogether of cold-blast iron, with a hard crystaline head and fibrous flange. Some of these are being sent to India; and it may be presumed they will stand an immense amount of use, and will repay the larger first cost.

PATENT TYRE MILL.—This mill was commenced in July, 1861. The tyres are made from a peculiar kind of steel, and are rolled out to the required size by suitable machinery; tyres are rolled from 2 ft. 9 in. diameter for trucks to 7 ft. diameter for locomotive wheels. These tyres, when cold, may be bent till they touch in the middle, forming a figure like an 8, without showing any sign of fracture. When broken by other means the fracture is close and crystalline in appearance. Though these works may be little known, an extensive manufacture is carried on, the most notable features being the hardness of the tyres, and not showing any appearance of welding.

TRANSIT OF MATERIALS.—A stationary engine at the top of a long incline hauls iron ore, hematite, and other materials from the Monmouthshire Railway to the level of the bottom of the blast-furnaces and the forges. There are four locomotives, on the 4 ft. 8½ in. gauge, conveying these materials and coke from this level to the level of the top of the furnaces, both at the old and new works; this is effected on a steep gradient, by taking a circuitous route. The London and North-Western Railway Company have recently completed a branch line from Blaenavon to Brynmawr, a length of 4½ miles, forming at the latter place a junction with the Tredegar and Abergavenny Railway; this will give an independent route from Blaenavon and other works for the iron, coal, and coke traffic to Liverpool, Manchester, and the Staffordshire district.

COAL AND IRONSTONE MINES IN CONNECTION WITH BLAENAVON WORKS.—The royalty leased by this company is very extensive; part of it is sub-let to other coal proprietors. The quantity of coal raised on their own works is about 1200 tons daily, not more than 70 tons being sold, the remainder used in the concern. There are eight pits from which coal and mine are raised, and one slope; the principal of these are the Coity pits, 133 yards deep to the Bottom Vein mine; this is raised to the extent of 2700 tons per month. The winding engine is a 30-inch cylinder beam engine, 5 ft. stroke; cog-wheels 1 to 2; rope rolls, 9½ ft. diameter; the wheels and rope rolls are all under cover. There are two pits, downcast and upcast, one band in each. The workings in the mine are to the west, or dip; an engine is placed near the bottom of the pit for hauling up the dip, and also for forcing water so far up the pit. The steam is taken down the upcast from a boiler on the surface, and is taken from the engine up the pit in pipes and exhausts into the chimney. The heat of the pipes in the upcast causes the ventilation. The mine, after being exposed some time to the weather, is filled again into the trams, and sent down by a self-acting incline to the top of the furnaces.—2. Dodd's slope, driven to the dip in the Three-quarter seam, is 1300 yards long. The hauling engine at top has two 18-in. horizontal cylinders, one 6 ft. drum, raises 400 tons of coal per day from the Three-quarter and Big seams.—3. The Forge Balance pit is situated between the forges and mills, and in it coal is raised for the use of both.—4. The Old Coal pit; the produce from this is raised by a water-wheel.—5. The Cinder pits.—6. The Hill pits.—7. The Balance pit, raising black pins mine.—8. The New pits, raising coal and mine.—9. The Garn pits.

THE GARN PITS.—These are situated about 1½ mile from the old furnaces, on the eastern side of the valley; two tank locomotives are used in bringing the produce of these and other pits to the coke yard at the top of the old furnaces; these run on wrought-iron tram-plates, 3 ft. 4 in. gauge. The Garn drawing-pits are about 6 yards apart, with a band in each from the winding-engine; the upcast pit is 20 yards from the others; winding-engine, 28-in. cylinder, 5-ft. stroke, 30 lbs. pressure; beam-engine; cog-wheels, 1 to 3; rope-rolls 14 feet diameter; the wheels and rope-rolls are under cover; one tram in each carriage, holds 27 cwts. of coal on an average. The pits are 90 yards deep to the Bottom Vein Mine; from thence drifting westward 120 yards, the Old Coal seam is reached.

THE OLD COAL SEAM.—A dip is driven down in this coal to the west, 450 yards long; the dip of the measures averages about 3 in. per yard, near the bottom it is less. An engine for hauling up this plane is placed at the top, one 18-in. horizontal cylinder, 3-ft. stroke; cog-wheels 1 to 2; one drum, 7 ft. diameter; 8-in. steam-pipes brought from the surface, 7-in. exhaust-pipes to the bottom of the upcast. The engine lowers four trams each journey; they run into six branches—three on the north and three on the south side.

SECTION OF THE OLD COAL SEAM—Cliff roof.

(South side)			
	1. Coarse coal	1 ft.	0 in.
	2. Clod	1	0
	3. Coarse coal	1	6
	4. Clod	2	0
	5. Good coal	3	0
	Parting.		
	6. Bottom coal, inferior..	1	8=4 ft. 8 in.
	Rashes and underclay.		

The coal is worked by long wall on the south side. The coal No. 3 is left for roof; holing is made in the clod No. 4; the latter is used for filling up the work. On the north side of the plane this clod is of a hard rocky nature, and forms the roof: there is little material then for filling up, and the stall and pillar system is in operation. Levels are driven north and south out of the engine plane, at first 80 yards apart, but every alternate level is afterwards stopped, and the distance between the permanent levels will, therefore, be 160 yards, these are driven narrow, and some of them are 1200 yards or more in length. In the long wall system cross-headings are driven from the levels to the full rise, 60 yards apart; out of the cross-headings gate-roads are turned in a south-east direction, 20 yards apart, the face of work running at right angles to these, or north-east and south-west. This is supposed to be the means of obtaining a better roof, by crossing the direction of the slips on half-course. The excavation is filled up close with the clod and material cut from the top, to re-

heighten the roads after the crush comes on. On the north side of the plane stalls are driven 8 yards wide, single road, pillar of coal between 6 yards; the stalls are driven to the rise from the north levels, against the faces, 80 yards in length, the pillars are then worked back. The bed No. 4 forms the roof; there is little material for stowage; the good coal and bottom coal are both worked here. Very little gas is seen, a little is thrown out from the engine coals when the top falls. At the bottom of the plane, on the north side, the bed No. 4 changes to clod, and with it long wall work can be carried out, as on the south side. The colliers work with candles; the production of gas is comparatively small, and with the exercise of proper care accidents have been avoided. The trams for the coal are open-bodied; 18-in. wheels, running on tram-plates, wrought-iron; gauge of road, 3 ft. 4 in. Very little water is produced in the Old coal; one hand-pump is at work, which clears it of water up to a certain level.

The Bottom Vein Mine.—This is also worked to the dip by an engine-plane 440 yards long. The engine is placed 100 yards north-east from the pit; it has two 14-in. cylinders, 2-ft. stroke, cog-wheels 1 to 3; one 6-ft. drum. It is supplied with steam from the pipes before mentioned. The engine draws four full wagons up the plane past the north level, and drops them back to the pit. The empty wagons are drawn from the pit to the engine, and run down with the rope into six branches, three north and three south of the plane.

Section of Bottom Vein Mine—Cliff top.

1. Shale hangings	0 ft.	6 in.
2. Bottom mine	0	4
3. Clod	0	4
4. Butt, strong cliff	2	0
5. Shale	0	9
6. Pin mine	0	3
7. Clod, holing	0	6=4 ft. 8 in.
8. Bottom shale, with balls of mine.		

About 2 ft. of the bottom shale is taken up in the gate-roads for horse height; the gate-roads are driven to the rise out of the levels, 20 yards apart from their centres. The working is carried forward in one long wall face, filled up with butts and other stone behind to within 2 ft. of the face; no timber is required along the face; very little powder is used; the pressure on the face is sufficient to break the ground down after cutting out the clod. The proportion of material sent to bank is three trams of shale to one of mine. Before the stalls reach 80 yards the gate-roads require re-heightening; this is done by taking down the top. Every alternate level is discontinued as the work is driven up 80 yards, and the work from two levels is concentrated into one, outwards to the engine-plane. The gauge of the road in the mine workings is 2 ft. 2 in. The wagons have flanged wheels, run on single head-rails. The material raised daily is—Coal, 350 tons; mine, 50 tons; rubbish, 150 tons: total, 550 tons.

Ventilation and Drainage.—A furnace is the agent for ventilation in the Garn pit, as well as in the other mines at Blaenavon. About 40,000 cubic feet are stated to pass up the Garn upcast, and 25,000 cubic feet to another upcast, giving a total of 65,000 for the ventilation of the workings in the Old Coal and Bottom Vein Mine, which, considering the small production of gas, may be considered an ample and sufficient ventilation for the whole mine. There are 18 horses employed in the coal workings, and three in the mine workings. The water flowing from this pit runs either to the Coity pits, where there is an underground engine, adapted to pumping water, or it may go to another pumping pit, where water is raised by means of two water-wheels, one above the other, and the drainage of the whole of the mineral property east of the water-level line is thus effected.

About 6000 persons are employed at the Blaenavon Iron and Coal Works. A large number of females are employed about the furnaces, and in stacking and filling up mine at and about the collieries. The forges were commenced in September, 1859, and the rolling-mills in January, 1860. The new railway to Brynmawr, just made, passes close to these works, and is intended to be opened on Nov. 1, giving increased facilities for the carriage of the Blaenavon iron to the market, both in the shape of pig-iron, rails, and merchant bars.

Oct. 26. M. B. Gardner.

MINERAL WEALTH OF SPAIN—No. II.

Sir,—In the concluding remarks of my last letter, respecting the mineral resources of Spain, I remarked that nearly all the newspaper accounts relative to that country should be read with great caution. I will now give you positive evidence of the truth of my assertion. During my late residence in Spain, at the time of the revolution, in 1868, being then unavoidably detained in the province of Estremadura, conducting some mining operations, I visited the towns of Truxillo, Merida, and Badajos on mining business, and likewise the different casinos, or club houses, in order to get some insight into the news of the world. To my great surprise, I saw it stated in an English newspaper that in those towns there had been great bloodshed. Of course, I knew such statement to be incorrect and exaggerated, sent by some interested parties in order to keep up the unfortunate excitement. Now, being an eye witness of the revolution, all that came under my notice was that the excited people rushed to the different town halls, and tore down the likenesses of the late queen, and burnt them in the public squares. From the above facts I leave your numerous readers to draw their own conclusions.

I will now give you a short account of what an English company are doing, and have been doing since the year 1856 (and all through, be it understood, the worst times of the troubles, trials, and difficulties of the revolution, and other commotions which have occurred since the company was first established, and during all which time they have maintained a continual prosperity, and their works continue in a flourishing condition), translated from the Madrid newspaper, *La Epoca*, of Jan. 15 last:—

"Few recompenses have been so just as that recently conceded by the Provisional Government to Mr. A. de Burg, director and principal manager of the copper mines of Huelva, and director of the mines at Tharsis, Calanas, and Poyatos. This company was organised in England with a capital of one hundred millions of reals. It has conferred very great and important benefits on this part of the country, in establishing such a centre of industry, of such great importance. When the company commenced operations in Spain, in 1856, there were only 69 habitations, or huts, for the operatives: there are now 420 healthy habitations for the principal workmen, besides other families, who all live rent free. At the suggestion of Mr. de Burg, the company have constructed a hospital, with 12 beds, having a permanent medical man. They have also established a school for 120 boys, and two schools for girls, with work-rooms to instruct the girls in household work, in order to benefit their families. They have also an academy of music for the workpeople to assemble in at night. All the masters are paid by the company. In order to improve the condition or the workpeople, the company have established a large provision shop, sufficient to supply 4000 persons at prime cost; but it must be understood that there is no speculation in the shop in a pecuniary point of view. Tharsis possesses also a church, whose curate is paid by the company. They have now authority to erect a place of worship and a cemetery for the Protestant part of the community. The railway of 59 kilametros, which unites the mines to the sea coast, is nearly complete, at a cost of nineteen millions of reals, and, thanks to the prudence of Mr. de Burg, the company have carried the undertaking through without obstacles or lawsuits, showing the great importance of employing proper persons, who know our people and country. By the perseverance of the company they have rendered eminent services to the industry of this part of Spain, and proportionate benefit to the workpeople of this province. The company employ upwards of 3000 persons daily, and pay wages to the amount of twenty-four millions of reals annually. The principal mining engineer is Mr. D. R. Garey, who, by strict economy, persevering energy, and good administration, produces for the company good results and abundant products."

This interesting account plainly shows what can be done in Spain with good management and energy. But it should be clearly and distinctly understood that proper persons should be selected, who know the country, and how to treat the workpeople: this is most important, and should be strictly adhered to, as many, unfortunately, have come to grief through ignorance of the language, laws, and customs of the country, thus bringing others into discredit through their want of practical knowledge, consequently blighting operations, and preventing others from speculating, through giving the country a bad name.

I will now revert to the phosphate mines of Spain, particularly to those of Estremadura. The mines in the immediate vicinity of Caceres, the capital of the province of Estremadura, can now produce, from the mines already explored, from 30,000 to 40,000 tons per annum of mineral phosphate, of from 70 to 80 per cent.; and some of the mines in the same province, situate at Lograsan, a still higher standard. The Local Government reports show that new mines are being opened out; consequently it may be considered that the phosphate mines of Spain are inexhaustible. Nearly all of them are outcrops, showing with what great facility they can be worked. The most lamentable thing we have to record is that they are nearly all abandoned, from want of capital, energy, and intelligence to properly develope them. Here is a mine of wealth for some enterprising capitalists, when it is generally understood and proved by agricultural chemists that the mineral phosphate of lime, with its proper constituents, is the nearest approximation we have as a fertiliser to Peruvian guano. Hitherto the price of that article has been so high as to prevent the British manufacturer of artificial manures from properly developing this branch of agricultural industry. True, the German phosphate of lime has been extensively introduced into England; but, in consequence of its inferior quality, it is in rather bad repute, which brings discredit on the manufacturer. The Spanish mineral phosphate is proved by careful analysis by eminent practical chemists to be of much more value than the German; in fact, it contains less impurities than any yet known.

It is generally known that agricultural industry is at the lowest ebb in Spain, the land being cultivated in the most primitive and clumsy way. Having had many years practical experience in the country, I am able to speak on the subject with certainty. Indeed, were it not for its genial climate, agricultural produce would be at a stand; as it is, the whole country does not produce what it formerly did by a large amount, which can be proved by an examination of the various archives from the time of the conquest of the Moors by the Spaniards; therefore, the only valid reason we can give for this diminution of agricultural produce is the want of a good and cheap artificial fertiliser, in order to stimulate the nearly exhausted land. Here is a wide field for a profitable speculation—a gold mine in itself. The land requires a fertiliser; the article is in the country to manufacture it cheap and good, only waiting for enterprise and capital. In the face of all this natural wealth in the country, there is not in the whole territory of Spain one manufactory of artificial manure, while there are thousands of acres of land now out of cultivation and lying idle for want of a good and cheap fertiliser to improve and bring it into a state of cultivation. With such appliances Spain would soon become the granary of Europe.

Some of the rich landed proprietors use a little artificial manure, which is chiefly exported from England, of very inferior quality, and which does not give general satisfaction, with the price far too high. The farmers generally cannot afford to purchase what they really want. Gladly would they avail themselves of the opportunity were it within their reach. If the article were manufactured in the country at a reasonable price the sale would be enormous: the small proprietors and farmers, rather than miss such an opportunity, would actually purchase by barter—that is, payment in produce, or one-half in cash and the remainder in produce. Such is their anxiety to improve their land, and bring it into fertility again.

Another important feature in connection with the rich mineral district of Caceres, the capital of the province of Estremadura, is that a railway is now in contemplation from Caceres to Merida, about 11 leagues in length, which will intersect the whole system of railways in Spain and Portugal, thereby stimulating the industry of the mining districts, and facilitating the exportation of all kinds of produce, particularly of mineral phosphate; of which, if thought expedient, the manufacturers, merchants, or mining speculators could export the higher class to Great Britain and other ports, of which there is abundance for all purposes. On the completion of the short line of railway, speculators and merchants there will be enabled to compete with any country in the world in minerals and other products. There are other important products besides minerals for export in the same province, such as cork, wheat, wool, and cattle, which could be made available to any extent by parties interested in general commerce, and all contiguous to railways.

The preceding remarks on the mineral wealth of Spain, and her other sources of commercial industry, give only a mere outline of the immense wealth of the country, when properly developed. Scotch capitalists, to all appearance, are far more long-sighted than the English in seeking out the nooks and corners of the world where wealth is to be found; for a company of Scotch capitalists have already commenced operations in the South of Spain, working and getting out magnetic iron ore, and have actually commenced laying down a railway to the nearest port, in order to transport the mineral from the mines to the sea coast for shipment.

I have in view at a future period, by your kind permission, to give a short history of the rise and progress of the iron and lead manufactories, and silver extracting, which no doubt will be interesting to some of your numerous readers, showing our English capitalists and manufacturers the great advantage they would derive by transplanting themselves and their superfluous capital to that splendid country, where health and prosperity await them.

Manchester, Oct. 25. B. H. Howarth.

MINERAL RESOURCES OF WEST BRITAIN.

Sir,—The subject of this communication is not the mining interest of the Principality, or of the great south-western English counties. The term West Britain has been sometimes applied to the Sister Island, and happily so, especially as now a course of conciliatory legislation has been resolutely taken up by the English people. There can be no doubt that henceforth the resources of Ireland will be sought out and developed. The press is teeming with articles on the subject; and it is appropriate that the *Mining Journal* should throw some light upon the mining capacities of that country. Last week the letter on the Fuel Resources of Ireland placed the wealth of the country in that respect before your readers. In this letter it is desired to afford some information as to the metallic stores hidden within her bosom.

Gold was known in Ireland, and found there in considerable quantities in the remotest times of which we have any record. In the earliest manuscripts reference is made to its abundance, and incidental expressions convey with great frequency the fact that it was used to ornament the persons of both sexes even lavishly. Weapons of war were frequently hilted with gold, and the metal was used for domestic purposes, and for general decoration. In the British Museum the specimens of ancient gold ornaments which were found in Ireland exceed in value all the rest. It is certain that Anno Mundi 3556, in the reign of Tigherumas, it was well known and carefully explored, for in one of the oldest records of ancient Ireland we read that it was first melted at that period in the territory of what was then called Fodharta, "to the east of the River Liffey." We learn from an ancient Norman historian that after the Norman Conquest of the gold tribute which was borne to Normandy no gold was sent from England, the tribute consisting of silver; while from Ireland a larger amount of silver was transmitted, and besides 400 ozs. of gold. In 1796 gold was discovered in the alluvial deposits left in the streams issuing from a range of hills separating the counties of Wicklow and Wexford. There has never been any scientific effort to work the neighbourhood, although, besides the large amount found in small particles, there were nuggets obtained of considerable size. One of 22 ozs. and another of 18 ozs. were obtained nearly in the same place. Generally it was found in connection with magnetic iron-stone, iron pyrites, hematite, wolfram, manganese, fragments of tin-stone, and quartz.

The next most precious metal (silver) was also known, and is now obtained in Ireland; after the Norman Conquest Ireland's tribute was 200 marcs. At present the Tipperary Silver Mines are the chief source of supply. Other mineral substances are obtained there also in varying proportions, such as iron, zinc, pyrites, ochre, sulphurate and carbonate of lead. Silver is also found in the county of Wicklow, the geological peculiarities of which show that such was to be expected. There is a proportion of silver in several of the lead mines. Galena abounds in the Irish lead mines, and it is nearly always argentiferous. Lead is mined in various parts of the country. It is found in Wicklow in divers districts, in the counties of Armagh, Down, from South Monaghan to the north of Dublin, and in Cork and Waterford to the south. Zinc ore in one particular form, the sulphuret or blende, is found in connection with veins of lead and copper ore. Less is said in ancient Irish annals of copper than of any other metal, and less of it is found than of any other in Ireland now. Copper and cobalt are obtained in Kerry, Cork, Waterford, Tipperary, and Galway; but lead greatly more abounds throughout the country.

Tinstone is found in the sand and gravel of most of the streams which flow from the Wicklow mountains; and to the south and east of the Vale of Ovoca, so famed for its picturesque beauty; but no veins or lodes have as yet been discovered. An ancient chronicler records that around the Lakes of Killarney, embracing at once the grandest and the most lovely scenery of Ireland, tin exists. He describes those beautiful expanses of water as fringed with four metals—gold, silver, tin, and iron. Iron was the last, it would appear, of the metals which became known to the ancient Irish; and, happily, it is very extensively diffused in that country; and where there is iron there is coal to work it—so that Ireland possesses these two grand materials of modern civilisation. To her coal and iron England owes her political ascendancy, her naval greatness, her material wealth—aye, and to some extent her moral grandeur. Ireland possesses both; and who shall say that under the fostering hand of her more powerful sister she may not ultimately and soon use efficiently these appliances of prosperity. There is no country which produces so much iron of the greatest purity in proportion to its whole yield. Clay ironstone is almost the only source of iron to Great Britain; in Ireland its accumulations are vast, and, moreover, the finest specimens of the purest iron known have been found there. The iron of Sweden is not better adapted to the manufacture of steel than is that of the place named at the head of this communication—West Britain.

In the letter last week on the Fuel Resources of Ireland it was shown how extensively iron was diffussed in that country, and that if properly developed furnaces and forges might cover the land. At present the iron works are numerous, and afford employment to many; but multitudes of the starving poor would have opportunity of earning and eating honest bread if capital and enterprise were applied to her mines of coal and iron. I may on some future occasion trouble you with some statistics in confirmation of what is here affirmed.

Dublin, Oct. 25. Erinach.

IRELAND'S RESOURCES—PEAT FUEL.

Sir,—I have read with much interest and gratification the cheering information from your Dublin correspondent, "Erinach," in the *Mining Journal* of Oct. 16, and fully concur with him in his opinions. That Ireland possesses immense sources of national products in commercial wealth is most certain, and if rationally and wisely developed will become sources of capital and labour, combined in co-operative efforts by men of ability and influence, working hand in hand for general advantages. Having devoted nearly 20 years of attention to the subject of peat bog conversions, for production of peat fuel for steam-engines, I have arrived at satisfactory results in the production of powerful machinery, which I am endeavouring to introduce, for creation of a superior fuel, and also for the conversion into first-rate charcoal for steel and iron works, immensely beneficial beyond wood charcoal. All, I trust, will be thoroughly and quickly proved practically by a combination of Irish liberal landlords and men of capital in testing working facts by actual results. I have had plenty of praise and approbation of my plans and principles, but it requires active and positive assistance financially. I am willing to give all required information of these important proposed peat workings, which will convert that which is now almost unproductive into large sources of national wealth and commerce, by the change from peat bogs into productive farming lands, and providing employment to thousands of workmen, who are now in a state of semi-idleness and despondency, creating Fenianism and morbid political expressions of feeling, which would be obliterated and removed by healthy remunerative employ. I hope that "Erinach" and others may come forward and lend a vigorous aid in this cause.

W. Austin, C.E.

8, *Culmore-terrace, Carlton-road, Old Kent-road, Oct.* 25.

SEPARATING GEMS AND GOLD FROM OTHER MINERALS.

Sir,—Seeing in a number of the *Mining Journal* recently allusion made to what is described to be a new apparatus for the separating gems and gold, or minerals containing the latter, by a new washing process, depending on the more rapid fall of such materials through water than other minerals with which they may be associated in the immersion, in consequence of their greater specific density, or gravity, I am reminded that previously to leaving New Zealand, in 1856, I caused to be constructed of wood an apparatuz calculates, as I thought, to answer this purpose on a small scale, which, however, I never put to the test, although I took it to Coromandel on purpose to do so, where I left it, having to return to Auckland, and embark for Sydney, on my way to England. The following, however, is a description of the apparatus alluded to, and is intended only as a model sketch of a working apparatus, constructed on the same or similar plan.

It consisted of an oblong, nearly water-tight, tub, standing on its square base, of about 1 ft. in width and 5 ft. in height, having the top open. About 1 ft. above the base of this apparatus there was an opening on one side, to admit a wooden tray about 2 or 3 in. deep, which when inserted entirely interrupted the communication between the upper and lower portion of the tub, or apparatus, and when drawn out to its back edge closed the opening by means of it, rendering the tub as nearly water-tight in that part as it was when the tray was closed. In its drawn or open state, the tub being filled with water, and a spade-full of the *sifted* soil, supposed to contain gems, gold, or minerals containing the latter, thrown into it, they would, if present, subside to the bottom of the tub first, in consequence of their superior specific density, or gravity, to that of the other minerals they are probably associated with, leaving the latter to follow less rapidly, so that after a short interval (the duration of which must be decided by experiment), by suddenly closing the tray, the precious minerals below may be separated from the unimportant ones above. To receive the former there should be another tray at the base of the apparatus; and in order to prevent the accumulation of soil on the edges of these trays, so as to impede the motion to and fro of them, they should be bevelled, or sloped inward, on their edges. In order also to prevent the pressure of water from above interfering with the closing of the upper tray there should be a water-tight closer in the apparatus at the back of the tray, to be opened when the tray is inserted, the back of which should close the space left open by the opening of the closer.

The dimensions of a useful working apparatus constructed on the plan set forth in this *model* sketch, if found to answer, would, of course, have to be much greater than those here given, and the plan would have to be modified accordingly. But, all else being the same, there is no doubt that the greater depth of water the minerals have to pass through, and the greater distance asunder the trays are placed, the better.

F. H. B.

N.B.—The foregoing is not intended as a description of a *working* apparatus, but simply suggestive as to the plan on which one might be constructed.

MINING—DUTIES OF LANDOWNERS.

Sir,—Almost every person who is practically acquainted with the metalliferous mines of Cornwall will agree with the statement contained in Mr. A Bennett's letter on this subject, which appears in last week's Journal, that "it is now an established fact that tin does exist under copper," and then cites as an instance some of the famous mines of Camborne and Redruth, whose lodes have become metamorphosed. With respect to his suggestion relative to the mines extending from Old Wheal Fortune to Godolphin, also Crenver and Wheal Abraham, and the Great Western Mines, becoming equally rich in tin, if explored deeper, I consider it highly probable that such would be the result, especially if their several lodes pass into the granite which surrounds them, which they will hardly fail to do, seeing that some of them are close to that great tin-bearing rock, and none of them at any very great distance from it. Although some of the mines referred to above may be a mile and upwards from the base of the granite hills, which are to be observed in places dipping at about an angle of 45° underneath the clay-slate basins of the district, it does not follow that they will continue to dip at this angle until reached by deep sinking at the mines in question. Judging from what has occurred at other mines similarly situated, the granite in all likelihood will be found to crop up, or to have the shape of hills and tors under the killas, in which case the lodes of the district will be discovered traversing the granite probably scores of fathoms higher up than the engineers in charge of the operations calculated on—a beautiful illustration of this kind has taken place at East Pool and Wheal Agar Mines, near Redruth.

The clay-slates, or imperfect schists, of Cornwall are, doubtless, of high antiquity, and had man existed prior to their deposition he would have seen that the surface of the dry land was then granite, with probably deeper valleys and higher hills than we now see. To

use a simile, the surface at that period may be likened unto the sea in a storm, and at this period to the sea in a calm. The discovery of those immense deposits of tin in lodes that were once equally productive of copper in all those mines extending from Carn Brea to Dolcoath, is quite a new era in Cornish mining, and is undoubtedly a happy stimulus to all companies who are at present engaged in this staple industry of the county.

I do not think that the Cornish lords are, on the whole, so illiberal to mining as many persons imagine them to be; for my own part, I consider they are becoming more favourably disposed towards it every year, and in doing so, I beg to be allowed to endorse the statement of your correspondent, that no one would be more largely benefitted than the lords themselves. W. R. RUTTER.

Horrabridge, Oct. 26.

VIRTUOUS LADY MINE.

SIR,—I regret you could not find room for my letter last week, simply because I referred my friends, the shareholders, and the public, to it; however, better late than never. The machinery is working well, and has forked between 6 and 7 fms., but we are now in a perfect pool, the greatest and most extensive working of the mine, and shall not make much apparent speed for some days; however, we are even now, with all the drainings, forking 1 inch per hour in the engine-shaft.

I find the Virtuous Lady shares quoted in the newspapers at 25s. to 30s. each. I would not condescend to take notice of these frequent, unjust, and ungenerous attacks made upon me and the mine, but that shareholders who have purchased at 2*l.* may think it strange upon seeing these quotations in print. Only a few weeks since shares were sold by me at 1*l.* each, in answer to our prospectus, to the extent of 1000 shares; they were placed in the hands of all sorts of parties in all parts of England. I do not believe the brokers who quote our shares at from 25s. to 30s. have a single one to dispose of; however, it is possible that some of these shareholders may be satisfied with 10s. per share profit, and, if so, I beg to apologise to any broker who may be acting for such a client; but at the same time, as these clients were originally mine, I feel myself bound to protect them as far as lies in my power—more especially, too, when by so doing it adds to my own advantage. I confess to being a little selfish. The summary of this is, that I am open to purchase shares at 37s. 6d.; this will give me 2s. 6d. profit, as I can get 2*l.* easily enough, particularly when any intending investor only takes the trouble to visit the mine, and see facts for himself, it is not a bad profit, almost cent. per cent. in a few weeks. And, undoubtedly, if those who have purchased at 2*l.* wish to win money quickly, I shall be able to buy of them in a few weeks at 3*l.*: but it is the *bona fide* legitimate shareholders who will reach the real winning post, and secure the grand prize. I am more and more convinced that in the course of time—by time I mean some 12 months—this will be one of the greatest dividend mines of the day, and will improve year by year, as time enables further and deeper explorations to be made, and science and trade step in and add profit to profit. Neither friend nor foe, mining agent, or broker, geologist, mineralogist, metallurgist, or analyst, can, I believe, come forward and deny that the Virtuous Lady has not every element of success; if they feel they can do so, now is the time for them to make contrary predictions to mine, as the actual working of the mine must verify our prophecies on one side or the other. Again, if other opinions exist, for the sake of the public, it would be kind and charitable to speak against my predictions, so as to allow the public the benefit of deciding upon the arguments. But I ask—nay, I demand—one thing, let us have no fictitious signing of names, no stabbing in the dark, or I shall treat the letters with the silent contempt they will deserve.

5, Abbey Mead, Tavistock, Oct. 28. THOMAS J. BARNARD.

THE VIRTUOUS LADY MINE.

SIR,—Some of England's most practical mining men, with experience in Mexican and Colorado mines, have within the past fortnight visited the property which I have for some little time past been mildly yet zealously endeavouring to extol, and through the medium of the press it cannot have failed to have at least attracted the passing notice of thousands of readers in all parts. What is the result of these visits? The few who have condescended to take notice of my remarks and invitations have confessed that it is the most marvellous piece of mineralised ground they have ever seen at home or abroad; and there is but one general opinion of all, that in deeper sinking we shall have most immense deposits of copper ore—aye, let me give you my opinion. We shall have the richest copper mine ever yet discovered in England, and the most profitable one in the world. Tens of thousands of tons of copper have been taken from one lode at only 17 fms. deep, and we intend sinking 15 fms. deeper, and less than 100 fms. driving will cross-cut four different lodes,—and they are lodes, too; some of them 100 to 200 ft. wide, one mass, even near the surface, of gossan, prian, peach, mundic, quartz, and copper ore. Having given you my earnest and honest opinion as to the indications for copper, I should like to make a few remarks respecting the silver. It is universally known that a good portion of the gold discovered abroad is extracted by amalgamating quicksilver with quartz and other mineral matters, when the yield of gold is often not more than quarter of an ounce to the ton of stuff. Again, silver mines in Mexico, with 80-in. cylinder engines, steam to work the same being generated by wood fuel conveyed a fortnight's journey, at a most frightful expense, give profits upon as little as 10 to 15 ozs. of silver to the ton. I ask the question—What is there to hinder us from following in their footsteps and doing the same? Assays by Dr. Phipson, showing results of from 10 to 20 ozs. of silver per ton of stuff, prove that the average of the mass of our mineralised matters is not less than 10 ozs. to the ton. With our splendid rivers, the Walkham and Tavy, added to a fall of 100 ft., we could develope the greatest horse power ever yet brought to bear upon mining machinery, so that everything could be done at its cheapest; and again, in working for copper the lodey matters containing silver but no copper must be raised to surface, so that as regards the silver, the actual cost of extraction will not commence until it undergoes the preliminary process of being crushed and very finely pulverised, when more delicate machinery, skilful hands, and great care cannot *fail*, with the amalgamation of mercury, to extract the silver that exists. Of course, when there is much sulphur, which frequently contains silver, it is necessary to roast the ores with common salt, so as to get the silver into a more metallic state; but the cost of the whole is trifling, and if 10 ozs. of silver are really in the stuff—and why should I doubt Dr. Phipson and other assayers?—the profit will be most extravagant, as there is almost no limit to the mineral matter to be operated upon. Dr. Phipson and Mr. W. Richards, gold and silver assayers, have found traces of gold; and this is certain, that whatever gold there is the mercury will bring it out with the silver.

I am quite prepared to find many laugh at my idea of finding gold and silver to pay, but let those laugh who win. There are many who are ardent professors of pure logic, and the belief that nothing can be until it is, and most assuredly such individuals contribute but very sparingly to the advancement of science and trade, and no wonder, since they lack the main ingredients—faith, energy, and pluck, and, perhaps not the least of all, brains. If honest intentions, science, and determination can extract the precious metals to profit, you may depend upon not a stone being left unturned to procure these valuable adjuncts, and so carry into effect, and a triumphant denouement, the very point I am aiming at. Our machinery was started on Saturday with the greatest success, and everything continues to work admirably. We have forked about 3 fms. in the shaft, which is very good work, considering that we have had to drain hundreds of fathoms of levels, where in some places there is plenty of room for a coach and four to make a graceful curve, being the space left from whence quantities of copper ore have been extracted. Figures as well as facts must prove that tens of thousands of tons of copper have been raised from this mine. I am told that I have not yet seen 1-20th part of the workings, and yet I can answer for having walked through hundreds and hundreds of fathoms of levels, with openings and stopes at places as large as churches.

I cannot get at the real history of the practical working of the property earlier than this century, and I do not understand how the mine should be so little known, when it is quite clear that it must have cost tens and tens of thousands—aye, it must have gone almost into millions—of pounds expenditure to have made these great excavations. Is it not certain that this enormous expenditure must have realised some great income at least to have assisted in the carrying on of these gigantic workings? And, further, is it feasible that even if money had actually been supplied to effect these great explorations they would have been carried to such an extent if the discovery of mineral had not enticed as well as assisted the adventurers in their undertaking?—Bah! The matter is too palpable and simple to argue, and, perhaps, I show my weakness in noticing the twaddle that issues from the lips of some few London mining men who have never seen the property, and are simply vexed because it is attracting attention, perhaps to their detriment for the time; but they forget it is only important, grand discoveries which happen now and then, by ordination, undoubtedly, to a great extent, that keep mining afloat at all. If there is anything to say against the mine in any shape or form, say it out openly in the *Mining Journal*, and I will either contradict the statement, or confess to the fault, if it be truth, but you cannot run down and harm the mine. A whole army of you opposing it would be simply your "Kicking against the pricks." It is bound to be worked, and the secret of its success or not must come out. Ask the Tavistockians if they ever expected four months since to see the mine started, and the machinery at work this week (I never knew such a place as the Virtuous Lady existed before this summer)? They will answer No! Well, tell them and the world at large that this is only just a commencement of the astounding revelations they will behold within the next 12 months. Aye, I predict that before 12 months have passed we shall have more than 1000 men, boys, and girls at work in and upon the mine. Will some of you be kind enough to make a note of this, and use it either for or against me 12 months hence? Every visit I pay the mine I find something new to add, even fresh fuel to my faith. I allow the affair is certainly somewhat enveloped in mystery, but we shall penetrate it by explorations. Here is what some would call a remarkable thing. Our energetic Captain H. Horswill has already scrambled into one of the higher levels, now that the water has gone down, bringing out with him good stones of copper ore. He declares that already he has found three very good tribute pitches. However, nothing now will surprise me. Capt. Horswill from the first has told me his sincere belief that when the water was in fork we should find hundreds of tons of copper underground already broken for us—that is, in tutwork drivings good orey ground was passed through, and as the men were paid only for breaking the ground, no notice was taken of any copper, unless it had been very rich indeed, and the whole stuff broken was placed on one side in the deads. One can hardly blame the former workmen in a sense, as the proprietors who had the matter most at heart thought little of anything else but finding solid masses of copper ore, in which they could fairly revel, and have no trouble but to drag it to surface, and start it off to market upon donkey's backs, which was the primitive mode of transit before the roads were cut; as many as 50 mules and donkeys used to be kept for that purpose.

Talking of ore brings the matter of profits to my mind. I have learned from several different channels that one Capt. Williams worked this mine by himself some 20 years since, that he had next to no machinery, and only explored near the surface, and yet in the few years he worked it he from a poor man managed when he died to show himself possessed of property worth some 100,000*l.* However, let the profits have been small or large, one thing is quite certain—the mine even to its present depth has not been half worked, and I feel quite convinced all the greatest riches are below our present levels, where never pick has yet pierced or eye seen. By-the-bye, Capt. Horswill called my attention to the enormous piles of stuff that has been taken up out of the mine since it was first worked, and thrown away as rubbish. Talk about mining, some of the hearts of our miners would indeed be gladdened to only behold in their mines and lodes the very crumbs that have been cast away by the former workers of this property. I could hardly find a stone, and there are thousands of tons of rubbish, little mountains, as it were, without seeing copper in it—more or less, a little "cobbing," and the mass of it real good stamps work; and one solid "prill" of yellow ore, weighing about 5 lbs., I brought home with me, and shall keep as a specimen, as it is one of the finest and richest pieces of solid yellow ore I ever beheld. We have put a man and some boys to commence to turn this pile carefully over, and I think it is quite likely that besides the machinery for the sliver, we shall in a few weeks have, independent of crushing machinery, another water-wheel, and 16 to 20 heads of stamps.

I have much more to say, and several other subjects to bring forward; but, however, I must now only find time to invite the public and any mining man to come and see this most wonderful property, and judge for themselves. It may be said I do not fail to extol its merits—truth; but mark well, although I am aiming to make the thing known all over England, it is not for the mere purpose of selling shares. I am perfectly independent upon the matter, and for my part am quite willing not to dispose of another share under 5*l.*, and work the mine on further, and see the results. I have faith, and most assuredly I feel and know that I shall make a fortune out of the Virtuous Lady, but it must be done by its success; as if a failure, I should undoubtedly be the greatest loser.

5, Abbey Mead, Tavistock. T. J. BARNARD.

LEGITIMATE MINING.

SIR,—Having had thirty years' experience of mining in Cardiganshire, I would beg to remark that the letter of Mr. Charles Thomas, in the Supplement to last week's Journal, does him infinite credit. If he had seen more of our mining operations—in fact, if he had known the county and its mineral resources from his childhood—he could not have spoken more to the point than he has done in his elaborate exposition of NANTEOS CONSOLS. If there should be any doubt on the point, all I can say is let parties visit the property, and see if there has been one thing erroneous put forward. I hope to have the pleasure of being at your office on Monday, Tuesday, and Wednesday next; and if anyone feeling interested in the matter would wish to see, not our barren but productive hills, to have their company to return on Thursday would be a great pleasure to—

Goginan, Aberystwith, Oct. 27. ABSALOM FRANCIS.

MINING INTERESTS OF COLORADO.

SIR,—Herewith I send you the items of our last correspondence from Colorado, likely to be interesting to your readers.

Bartholomew House, Oct. 28. WILLIAM COPE.

Denver, Oct. 4.—I was appointed at the Exhibition just held here one of the judges of award of prizes for the exhibitors of ores, gold, silver, bullion, coal, and other minerals, which I take as a great compliment paid to my knowledge of ores and minerals. The first prize for silver was obtained by the Brown Lode, of which a number of specimens of ruby, brittle, and native silver were shown, as well as the "button" of 580 lbs. troy, reduced from 30 tons of ore. There were a number of other "bricks" and "buttons" of silver, weighing from 20 to 60 lbs. each, which got honourable mention. A lump of ore of 500 lbs., from the Veto Lode, got the second prize, the first-class ore of this lode assaying, from sample lots of 5 to 20 tons, from 300 to 360 ozs. of silver. Among the other principal lodes of the territory represented at the Exhibition, honourable mention was made of the Wheeling, Caledonian, Roe, and Boaz, the last a very rich vein, struck in running the Goss Tunnel. Of the gold lodes, the German lode of Gilpin county received the first prize, from the gold nuggets of which there was a very interesting and fine collection; the Hattie Jane lode was awarded second prize. The Terrible Mine was by accident not represented; I only arrived in Denver the second day of the Exhibition, or I would have entered our specimen of nearly 200 lbs. weight, assaying over $800 to the ton, but the 20 tons shipped to you, containing 500 ozs. of silver, is a sufficient evidence of its value, but I saw third-class ore of this lode reduced by the Krow dry concentrator process, and assaying before dressing $80 per ton only, that showed a value of $390 per ton. The poorer ores of other lodes represented were shown to have increased in value. The Cashier lode from $20 to $90 per ton, Seaton lode from $25 to $96, and others in a more or less astonishing degree. The mass of coal of 5000 lbs. from the Marshall Mine was 2½ ft. thick, 3½ ft. high, and 8 ft. long—a pretty good sample of our coal deposits. There were a lot of samples of native sulphate of soda in lumps and masses, showing a deposit fully of 6 inches in thickness, from a lake about 12 miles from Denver, which covers an area of 40 acres; the water is quite shallow, being from 6 in. to 4 ft. deep, and so strong that three barrels, Dr. Birdsal, the owner, says, will produce one barrel of crystallised sulphate of soda. At times large quantities of sulphate of soda can be shoveled up there sufficiently pure for metallurgical uses without artificial preparation, and thousands of tons could be produced there annually at a very small cost. From this the carbonates and bi-carbonates can easily, cheaply, and very rapidly be manufactured.

In connection with the Smith and Parmalee Mines (from the Briggs and Gregory lode, of which I have forwarded to you 20 tons of ore), I would say that the stamp-mill tailings of this company (which are wasted, and run into the river, all that the treatment of 350 tons of ore per week produce) assay 4 ozs. of gold and 22 ozs. of silver per ton, besides the lead and copper. This is a most astonishing fact, but true. The same company produced from their stamp-mill in three months 2883 ozs. of gold. R. O. OLD.

[For remainder of Original Correspondence, see this day's Journal.]

RE-WORKING OF REETH CONSOLS, OR THE GIEW CONSOLIDATED MINES.

It is a sign of the slow recovery of Cornish tin mining from the depression in which from two to five years ago it suffered, that few enterprises have been set on foot for the exploration of new ground, or the resuscitation of old mines which were neglected on account of the low price of tin. The fact of the matter is, that the attention of speculators has mainly been given to the recovery of dividends in mines where profits were in abeyance, and the energies of mine managers have been devoted to the complete restoration of their property and their funds to something like the state which they enjoyed for many years previous to the American war; but if the recovery has been slow, it has also been certain. Nothing can be better assured, as far as human foresight may perceive, than that the price of tin—fluctuate though it will, according to many circumstances—must rule high for years to come. The keenest merchants, the most experienced miners, have thoroughly made up their minds on this point—so thoroughly that, although much larger returns of tin ore might now be made at the expense of the permanency of the mines, this course is almost entirely abandoned, and some of the oldest and deepest bals are being developed in every direction, and large reserves of mineral are hoarded up underground. Never was there a period in the history of Cornish mining when the best pursers and agents kept more carefully in view steady and reliable, rather than brilliant and ephemeral, dividends. Never was the system locally known as "picking the eyes out" less discountenanced, and systematic, thorough, and miner-like search for wealth more in favour. Such being the case, and the old mines having settled in steadily to this laudable task, we are not surprised to find that attention is directed in right good earnest to the best of the partially-worked concerns, which were temporarily abandoned in the season of Cornwall's direst distress. Two or three such enterprises have recently met with public favour. There is the large and important undertaking of Crenver and Wheal Abraham, the Western Mines, and others. But none of them excel in probabilities of success, and in interest to the district in which they are situated, the mine of which we desire to say a few words—the GIEW CONSOLIDATED, in Towednack, one of a bunch of mines which have yielded, and are destined yet to yield, abundance of wealth to those who work with intelligence and perseverance.

The traveller who wends his observant way from Penzance to St. Ives will soon perceive, when he has passed through the fertile belt of ground in Gulval which produces early vegetables, that he has a series of higher and less fruitful uplands to traverse. The soil is scanty, the outcropping rocks are plentiful, the air is nipping. Passing by quiet hamlets and solitary farm-houses, a large extent of more level ground is reached, and a scene is looked on which is sure to attract attention. To the left hand and far ahead there is a remarkable break in the highest range of hills, and the nearest miner or labourer will tell you that this great depression is called the Wide Gate. Trendrine Hill is the one gate-post; Butter-milk Hill, the other. And you may easily fancy that through this wide gate once streamed the waters of the North Sea, as the earth reeled in her rotation, swept about the huge rocks we see scattered round us, and passed on to the southern shores to bury the beautiful forests of Mount's Bay and leaves the Mount a woodless, granite pyramid. Were these gates reached (probably, through Towednack, whose uncompleted church in so bleak a district appeals forcibly for aid) the eye would look towards St. Ives Consols, which has raised 700,000*l.* worth of mineral and paid the proprietors 111,000*l.* in profits; to Rosewall Hill, which has dug up 50,000*l.* worth of tin and divided 3000*l.* St. Ives Consols is one of the instances of a fine old concern, at work now like a giant refreshed, to which we have referred. Shares have each risen at least 10*l.* in value; and to secure a durable concern, a new 60-in. engine is in course of erection, and pitwork is being provided at great expense, so as to aid further exploration. Our business now, however, is principally with the district which extends from this side the Wide Gate back to where St. Michael's Mount rears its head—a district dotted by engine-houses and their stacks, by stamps and outlying sheds, and which, it is evident, is one of the great centres of Cornish mining industry. Here Nature has been sparing of her bounties on the surface, but prodigal of them below. Here, where Tradition says giants only once dwelt and filled their hill-castle with stream-tin, a mightier giant, with nothing mythical about him—steam—has enabled puny man to delve down into the recesses of the earth and to bring up untold wealth. Let us illustrate this surface poverty and these subterranean riches a little more pointedly. The whole of the rentals of Lelant and Towednack are only about 7500*l.* a year. At 24 years' purchase the bulk of this property would fetch just what Mr. Magniac, M.P. for St. Ives, gave the other day for a comfortable town residence! Yet the earth has yielded to the miners here half a million, there half a million; here again a quarter of a million, there again a quarter of a million; dividends to the extent of hundreds of thousands (inclusive of fortunes for many a well-known name), and dues to the extent of hundred of thousands more. As we turn and look towards the Mount, close to us is Wheal Margaret, which has raised 320,000*l.* of tin, given 68,000*l.* in dividends, and 14,000*l.* in dues. A dividend of 10s. per 896th share last quarter is to be exceeded by 10s. at the next account. Near by is Wheal Mary, which has raised 325,000*l.* in tin, with a profit of 42,000*l.* A new 40-in. cylinder engine has recently been put up here with new stamps; and the best improvements in mine machinery and for the economical "return" of tin have been introduced. Its neighbour is Wheal Kitty, which has given its friends 56,000*l.* or 57,000*l.* for themselves out of the 275,000*l.* yielded for the good of the community at large. But a nearer neighbour still, indeed the nearest, is the celebrated Wheal Reeth—a mine whose wealth enriched the district, laid the foundation of the splendid fortune of the late Mr. James Halse, for a long period the member for St. Ives, and gave that gentleman in his life time, as well as a series of adventurers from 1822 to 1867, considerably over 525,000*l.* in returns and from 20 to 25 per cent. of this in profits. Just the other side of the hill is Providence, with its steady dividends of 100,000*l.*, or just a quarter of its produce; East Providence, now in most promising condition; and, throughout the whole district, instances are abundant of golden rewards for well-directed labour, or of that good fortune which smiles sometime on those who do not merit it as much as others.

It is with the spacious piece of ground, the valuable surface and underground plant, and the large tract of hitherto unexplored territory annexed, known now as the Giew Consolidated, that we have to deal. A mass of statistics are before us, giving to a penny the tin procured from the Giew since 1838. We will not weary our reader with these, but will briefly say that the first great success of the mine seems to have been in the latter half of 1840, when tin was 46*l.* a ton. The sales increased until they reached 200 tons per annum in 1843, and 260 in 1850. The price varied from 38*l.* 10s. to 72*l.* 14s., in any one year, and the quantity from 143 to 260 tons. The Giew was yielding its 10,000*l.*, 12,000*l.*, and 14,000*l.* a year, when their was, most unfortunately, a run in one of the shafts, and access to one part of the mine was cut off. In an ill-fated moment the shareholders, who had drawn their thousands in profits, were seized with a fit of economy, and thought they would retrieve their fortunes by working the Durlo part of the mine and withdrawing expenditure from the main works. The resolution was an unfortunate one. The Durlo gave from March, 1859, to January, 1865, as much as 513 tons of tin, worth 71*l.* 10s. a ton; but all of us know too well what 1864 and 1865 were for mining enterprise, and it was stopped for a time. Billia Consols, another portion of the present Giew Consolidated, bore the brunt of the storm till 1867, the worst year of all; but in that winter it too declined to produce tin at the then ruinously low prices, and the three concerns now await the new spirit which is to resuscitate them, and change quiet and decay into animation and vigour.

From the date of suspension to the present time, however, some few individuals have constantly kept this property in view. The adventurers themselves were never unanimous in the abandonment, but the price first put on the setts and materials, 3900*l.*, could not be thought of, especially at a season of dulness and of the withdrawal of capital. Mr. T. Trewecke, jun., of Lelant, was constantly negotiating, and at last, after an expenditure of time and of money, which no one unengaged in similar labour can appreciate, he purchased the whole property, when the fainthearted thought Cornish mining was extinct, for 1400*l.* in cash (800*l.* of which he paid) and 1000*l.* in paid-up shares. A careful estimate has since been made of the materials by Messrs. G. Eustice and Son, of Hayle, and their value is fixed at 2390*l.* The slimes and burrows, judged by similar and recent successful speculations, are worth 1000*l.* But Mr. Trewecke has also secured the sett of some unexplored ground east of Giew Consols, and Reeth Consols, in Trink hill. It extends half a mile east on the run of the lodes, and is about half a mile wide. We need not dwell on the value of such a concession, especially where there is so excellent a chance of discovering valuable lodes. The "lords" of the whole of the property are the Hon. Mrs. Gilbert, Mr. J. A. Stephens, the Duke of Cleveland, the Countess Dowager Sandwich, Mr. W. B. Tyringham, the Champernowne family, Sir Wm. Williams, Messrs. Rodd and Tremayne, Mr. H. H. C. Phillips, Mr. T. Woolcombe, and others.

In all these matters capitalists must be materially guided by practical men. Let us see what these may have written as to the value and prospects of this property. Capt. Peter Eddy writes, under date Oct. 7:—"I fully concur in the opinions expressed by one and all with whom I have conversed—that you possess one of the best portions of mining property offered to the public in this county for many years. . . . If the general statements, made by those disinterested, and by those who may in some way be interested, be true, hundreds of men, even before the mine is in fork, could be employed, or who would take pitches on tribute on profitable ground. The virgin ground, east of Frank's shaft, lately secured, appears to be the most in favour, as it is believed by almost all that the run of tin ground in that direction is a distinct run of tin from the old shoot. It is well known that nearly all, if not all, of the ends driving in that direction, from the 45 to the 122 fm. levels, were opening out profitable ground when they were suspended."

Capt. Eddy is for erecting an engine on the Giew engine-shaft—the largest and best of all the shafts, and clear to the 122 fm. level. This would command the top-water of the mine to the 60 fm. level, and a 4-in. lift below that would keep it dry. Frank's shaft could be adapted to skips, to discharge the eastern ground of tinstuff. Perseverance, economy, and attention would not fail to realise the riches of the district.

Capt. William Hollow considers the old sett and the new, in combination, a good speculation:—"I think that, with careful and economical management, these mines, when properly laid open, will make good profits with the present price for tin."

Capt. Richard Martin says—"Looking at the tin ground in the Billia, in the west end of the sett, and the north lodes, and the promising lode in the bottom of Frank's shaft, and the virgin ground at the east end of the sett, it is my opinion that this mine, properly developed, will soon become a lasting dividend mine.

Capt. John Daw reports:—"The north lode is one of the champion lodes of this district. . . . The additional length added will make the sett now about 1200 fathoms long, by about 40 fms. wide. . . . This mine is in one of the best localities in the county for tin. . . . The adit has been cleared from its mouth to within a few fathoms of the engine-shaft, at a great cost—all available and indispensably necessary for the future development of the mines. . . . I consider this a valuable speculation."

Capt. Thomas Julian, of Great Wheal Vor, thinks the very fact of so much wealth having been raised from the lodes which run through this concern and other mines is sufficient to satisfy the most incredulous that the situation of the mine is all that can be desired for the production of mineral."

Capt. Arundel Anthony writes—"I have made enquiries of men who for many years worked in these mines, and they all bear the same testimony as to the value of the unwrought ground in the different parts of the mines. . . . There is tin in the levels and stulls to the amount of some thousands of pounds."

Messrs. Joseph Vivian and Son think favourably of the enterprise.

Capt. John Nancarrow, formerly of St. Ives Consols, says—"If tin be only broken as when the mines were stopped (which there appears no reason to doubt) from 15 to 20 tons per month might, when the mine is cleared, at once be raised; besides which, valuable discoverics are likely to be made, especially in the eastern ground, as it stands parallel with, and very near to, the richest mines in the district, so that the returns will, in all probability, be very considerable. . . . There is a great deal of valuable materials and machinery on the mines, including three engines, and a variety of pitwork. . . . The locality and position of this property, the richness of the district, and the fact of its having in itself such elements of success afford the strongest evidence it can be profitably worked, and give it an unusual claim to the notice of investors."

Capt. Thomas Michell estimates the machinery, the substantial and workman-like adit, and the tin on the floors and burrows at quite 5000*l.*, and adds—"That as Frank's shaft is completed to the 142 fm. level under adit, you are at once placed in the happy position of being enabled to drive 13 levels eastward into the newly-acquired virgin or unexplored ground. This adds, at least, another 7000*l.* or 8000*l.* to the value of the property. . . . During my agency in St. Ives Consols dividends to the amount of over 100,000*l.* were paid the adventurers; and were I twenty years younger I would guarantee to do that amount, or more, for the adventurers in Giew Consols, as the prospects are better than they were at St. Ives Consols when I went there."

All these and many other facts were brought under the notice of some gentlemen interested in Cornish mining and in the welfare of the district (and we doubt not well inclined to a fair return on a fair outlay). They met not long ago at Crotch's White Hart Hotel, Hayle, and resolved that about 12,000*l.* would test this property. They were not in favour of a large number of shares, and, presuming it at present to be in 48ths, Mr. Magniac, M.P., agreed to take four, Messrs. T. S. Bolitho and Sons three. Major Bickford two, and Messrs. Harvey and Co., two shares. All who read this will appreciate such a practical means of showing the good opinion entertained by these gentlemen of the speculation. Had the shares been in about 1000, the share list would be complete. Evidence of this was given in the districs itself within the last few days, when Mr. Trewecke invited any local speculators to meet him near the Giew Consols. Many responded to this, and, although limited means did not permit of taking 48ths in 12,000*l.*, several persons put down their names for quarter shares, or 192nds—no slight investment for people of moderate property. On this occasion Mr. T. Trewecke, who has laboured so assiduously to inculcate the value and importance of this property, laid before local well-wishers a succinct history of the old mine and of the new speculation, and from him and other speakers most of this article derives its information.

We have to express a hope that we may very shortly announce the shares appropriated to enterprising miners, in and out of Cornwall, and that Giew Consols has in store for us an additional means of bread-winning, and handsome rewards for its new owners.

THE GIEW CONSOLIDATED MINES.—Tin sales from March, 1838, to February, 1859:—2612 tons 4 cwts. 3 qrs. 4 lbs., producing 191,449*l.* 14s. 10d.

THE DURLO MINE.—Tin sales from March, 1859, to January, 1865:—513 tons 0 cwt. 0 qr. 13 lbs., producing 36,312*l.* 0s. 1d.

BILLIA CONSOLS MINES.—Tin sales from December, 1864, to March, 1867:—135 tons 2 qrs. 3 cwts. 6 lbs., producing 6759*l.* 15s. 6d.

TOTALS—The Giew Consolidated Mines..	£191,449	14	10	
The Durlo Mine	36,312	0	1	
Billia Consols Mines.....	6,759	15	6	= £234,521 10 5

THE CALIFORNIA GOLD MINES.—It seems probable that the Sierra Butte or Downieville Peak, about ten miles east of the town of Downieville, will soon take rank next to Grass Valley, as a centre of gold quartz mining. The Sierra Buttes, or Reis Mine, has been more regular in its yield and its profits for the last fifteen years than any other mine in the State. The Independence, adjoining it, is also rich, but has been badly managed, has lost several mills by snow slides, and has not recovered from the debts incurred on account of them. The Keystone, only three miles distant, on the opposite side of the North Yuba, has lately risen to be one of the most profitable of our quartz mines. And yesterday we had news that the Monumental—a mine newly opened at the Butte—had turned out one piece of gold weighing 106 lbs., and worth $40,000. There is some mistake about the figures, for a chunk of that weight would not be worth more than $25,900; but even at that value it would be the best piece of gold found in the State since 1853.—*San Francisco Alta, Feb.* 21.

THE ST. BRIDE'S UNITED SLATE AND SLAB COMPANY (Limited).—It has been decided by the shareholders that as they consider the undertaking cannot be carried on successfully it shall be wound-up voluntarily, and that Mr. W. Levett, of Basinghall-street, be appointed liquidator to wind-up the affairs.

SOCIETY OF ENGINEERS.—On Monday evening there will be a discussion on the paper read by Mr. Perry F. Nursey, "On English and Continental Inter-Communication;" and should time permit, a paper will be read by Mr. C. J. Light "On the Need for Further Experiments on Strength of Materials."

LONDON GENERAL OMNIBUS COMPANY.—The traffic receipts for the week ending Oct. 24 was 9427*l.* 17s. 1d.

THE GEOLOGICAL RELATIONS OF IRON.

[The following paper was read on Monday evening, before the Science Section of the Cleveland Literary and Philosophical Society, Middlesborough, by the President, Mr. Jones]:—

Iron is one of the most widely-diffused of the elementary substances composing the solid crust of the globe, and as this is a locality in which the metal is separated from the ore on an extensive scale, it may be useful and interesting if we endeavour to trace its more important geological relations. The subject of this paper may be considered under two heads—first, the mineral combinations of iron; and, second, the influence of these in the production of geological phenomena. Iron rarely occurs in a native state, but is mostly found in combination with oxygen or sulphur. With the former it produces—(1) protoxide of iron, which is usually found in combination with other substances, forming portions of many igneous rocks, carbonate of iron, &c.; (2) peroxide of iron—known under the names of red hematite, specular iron ore, and brown hematite, which latter is the oxide in a hydrated form; (3) magnetic, or black oxide of iron—a combination of the protoxide and peroxide. With sulphur, iron forms (1) common iron pyrites; (2) white iron pyrites; (3) magnetic pyrites; (4) arsenical pyrites. The metal also occurs in connection with chromium as chrome iron ore; with titanium as ilmenite; with tungsten as wolfram; with silica, and with other substances forming more or less important combinations, though it is only the commoner forms that play an important part in a geological sense.

We now proceed to consider the relations of iron as a constituent of rock masses. Though there is no particular reason why we should commence our examination with the igneous rocks, as these belong to all geological periods, it may be best if we take this division of rock masses first. In igneous rocks, of whatever age, we find iron is a constant constituent, in some varieties really reaching a comparatively high percentage. Having regard to the relations of the igneous rocks to the internal composition of the globe, it is reasonable to assume that this element is as widely distributed in those impenetrable parts of the globe which science is not likely to open out to human investigation, as it is throughout the igneous and aqueous deposits, which may be studied upon or near to the surface. It seems almost certain that the iron now found, in even the oldest sedimentary rocks, was originally derived from the disintegration of the earliest fire-formed rocks, the origin of which, in the present state of our knowledge, is involved in much obscurity.

The lowest sedimentary deposits are comprised in what are termed the Laurentian and Cambrian systems. Here we have a fast thickness of shales, sandstones, and limestones, which are for the most part coloured some shade of blue, which indicates the presence of protoxide of iron, in the waters in which these ancient rocks were laid down. Our common roofing slates from Cumberland, Westmoreland, and Wales may be taken as typical examples of the tint which prevails in the system under notice. In some of the more arenaceous beds of the series, there is a comparative absence of colour, probably due to the more rapid formation of these strata, and the consequent wide diffusion of the iron contained in the ocean at that period. At other times, however, very large quantities of iron appear to have been carried into the Cambrian seas, for we find in some places large deposits of oxide of iron in connection with the rocks of this age.

In the Silurian strata the prevailing tint is some shade of blue—that is, in the native condition of the rocks, as all masses which owe their colour to protoxide of iron weather into a brown colour on exposure to the atmosphere. In the British area a comparatively small amount of iron was present in the ocean of the Silurian period. It is noticeable that about the middle of the system we find a small mass of sandstone, which is coloured with red oxide of iron, and resembles, to some extent, one of the divisions of the Old or New Red Sandstone proper. Towards the close of the Ludlow age, when the Silurian seas teemed with the abundant forms of organic life that existed at that time, a comparatively sudden change occurred in the proportion of iron mixed up with the slowly accumulating sediment. What geologists have denominated "passage beds"—indicative of a gradual change from the life forms of the Silurian age to those of the overlying Old Red Sandstone, or Devonian period—are highly coloured with the red oxide of iron, and the same general character marks, in a higher or lower degree, the succeeding measures, forming collectively the Old Red and Devonian of England, Scotland, and Ireland.

The carboniferous system, which comes next in ascending order, presents us with immense deposits of limestone and shale, coloured by protoxide of iron; a great thickness of coarse sandstone, only slightly coloured; and the coal measures proper, the shales of which are not only tinged blue by the lowest oxide of iron, but the quantity of this substance was in some places so abundant as to lead to its being separated from a state of solution and segregated into nodular masses, which have formed most valuable seams of ironstone in Staffordshire, Shropshire, Derbyshire, South Wales, Scotland, and other districts.

The coal period was, again, succeeded by one in which the seas abounded in peroxide of iron, though a gradual change from the one condition to the other evidently occurred, as several local and intermediate stages can be traced through; for instance, the magnesian limestone formation to the Red Sandstones, sands, and other strata that form the upper Permians. But the New Red Sandstone, or Triassic formation, which succeeds it, is eminently pervaded by the red tint due to peroxide of iron.

From the close of the Triassic period those causes which led to the admixture of peroxide of iron with the sedimentary rocks ceased to operate on an extensive scale, as far as the area of British geology is concerned, and we may, therefore, dismiss the younger rocks with less minuteness of detail. In the South of England the upper Keuper marls are seen gradually shading upwards into the blue shales and limestones of the lias, and, indeed, in this district the change may be noticed, as the sandstone and marl at Leckenby, forming the upper part of the Triassic series, is decidedly tinged with the protoxide instead of with the peroxide of iron. The lower lias is blue throughout, but the middle lias is more arenaceous, and though in places it contains thick deposits of iron in the form of a carbonate, there is only a comparatively small quantity of iron generally diffused through the strata forming this subdivision. The overlying alum shale is coloured by protoxide of iron. The oolitic system consists of slightly coloured sandstones, with thick deposits of blue clay intervening, so that whilst considerable quantities of protoxide of iron were present at intervals the hydrated peroxide never occurred in sufficient abundance to leave much trace upon the contemporaneous sediments. In some places deposits of ironstone were formed, but the diffusion of peroxide was due to causes which only came in operation for periods of comparatively short duration.

The same remarks apply to the fluvio-marine beds of the Wealden. The green sand—lower and upper—contains a good deal of hydrated peroxide of iron, both diffused through the mass, and in more concentrated layers; and in some parts the green silicate of iron surrounds the grains of quartz forming the sandstone, thus giving rise to the name which this formation bears.

The chalk and tertiary beds are not rich in iron, though this material is found more or less to tinge nearly all the strata up to those most recently formed.

The drift deposits which are found filling up hollows, and covering over the regularly stratified rocks on all sides, are naturally coloured various shades of red, from having been derived from rocks in which the peroxide of iron largely prevailed. If, for instance, this country were again to be submerged, the drift produced by the washing of the ocean over the rocks, masses now occurring upon the surface would evidently be highly coloured by being mixed up with the materials derived from the extensive tracts of New and Old Red Sandstone in various parts of the country.

Having now examined the conditions under which iron occurs in the geological series of rocks, we may briefly notice the circumstances which influence the formation of extensive deposits of iron ore. With respect to the masses of red hematite to be found filling up cavities in certain rocks, as, for instance, mountain limestone of the West Coast, and the Devonian limestones of the South-West of England, it appears that at the commencement of the periods when the sea became highly charged with peroxide of iron the quantity was at first so great as to be deposited in large masses as sediment at the bottom of the ocean, especially in such cavities as might exist in the newly submerged surfaces, but, that the supply of peroxide was afterwards less, or was more widely diffused, and hence was mixed up with an increasingly large proportion of sand and clay, thus reducing the iron to a mere colouring agent. It is easy to see that any deposits of iron ore, formed under such circumstances, are likely to be comparatively free from impurities of an organic origin, as water charged with iron has evidently been fatal, in a great measure, to the existence of animal life; consequently, the deposits of oxide of iron which may be expected to lie at the base of the old and new Red Sandstone formations may also be expected to be free from phosphorus, and other organic impurities. The mountain limestone on the West Coast was under water during the new Red Sandstone period; hence its important deposits of hematite. It remains to be demonstrated how far this submergence of the mountain limestone underneath the Triassic seas extended. My impression is that it will be found that it was only in the western parts of the country that this submergence occurred; though, I believe, it affected the limestone from Cumberland to the South-West of England, and that in the mountain limestone of North and South Wales, Somerset, and Devon, many parts will yield deposits of hematite. I believe, also, that it will be found that the limestone of South Devon will yield large quantities of good hematite that have been deposited at an earlier age, that is, when the ancient British seas became, for the first time, highly charged with oxide of iron.

With respect to the clay ironstones of the coal measures, their mode of formation was by segregation round some organic neuclus, and hence it necessarily follows that they are more or less mixed up with organic remains, and the substances they would yield. It also follows that this class of ironstone can only be expected to occur in comparatively thin and irregulay layers. The mode of formation of the Cleveland ironstone, and of other somewhat similar deposits, is not yet fully understood, through elaborate theories have been invented to account for the occurrence of such extensive masses of ironstone. The main difficulty arises in accounting satisfactorily for the sudden influx of so much iron into the seas of the period when the oolitic iron ores were formed. Whatever the precise circumstances were, it seems clear that what are now thick seams of ironstone were at first only beds of oolitic sand in an unconsolidated form. The infiltration of the iron, and the changes thus produced, probably took place soon after the original deposition of the matrix in which the carbonate of iron is now found. These remarks apply more or less to the iron ores of the secondary formation. The conditions under which these deposits originated naturally led to their being largely contaminated with organic remains; and it may be expected that all iron ores found in connection with rock formations yielding fossils will be comparatively impure.

The limits of this paper will only allow of a cursory treatment of this important subject; but I have endeavoured to draw attention to two points which, perhaps, may be suggestive to some members of the section who have time to work them out. First, the purest oxides of iron ore are likely to be found in connection with rocks that were submerged during the earlier geological periods; and secondly, the desirability of ascertaining with tolerable accuracy the limits of this submergence.

— *Iron and Coal Trades Review.*

LIFE AMONGST THE COLLIERS.

Considerable interest in colliery life was created some time since by the publication of an admirable little work—"Thirty Years in a Mining District," which we remarked at the time was evidently from the pen of one who had had much experience in colliery working. We are now enabled to publish the subjoined extract from a forthcoming work by the same author, which will, doubtless, be equally well received:—

"Let us, without further comment, consider the frequent, awful, and almost periodical visitations of explosions in our mines—visitations which, as coal fields of the New World become developed, seem to threaten like fatality on our contemporaries. Whatever at the present day may be urged to the contrary, we must stand convicted that if the same amount of intellect were applied to the safe development of our mines which is exercised in our other avocations, there would be an end of these wanton sacrifices. How come such accidents? Though a simple question, it is a most pregnant one; but, nevertheless, whichever way we may twist it the answers to it are practically simple ones also. It is within the knowledge of the most ignorant of us that no explosion ever did, or ever can, take place excepting through an exposed light coming in contact with inflammable gas. We must, if these premises are correct, do one of two things or both—either get rid of the explosive agent by more air and improved ventilation, or improve the lamp so as to render it impossible that it can act as a medium for destruction in the hands of the most reckless of that neglected, hard working heroic, yet it must be added, improvident race—I say race, for assuredly they are exceptional in all their ways from the generality of working men. It will scarcely be credited, certainly not accounted for, by a future generation that men who, if they have not actually removed mountains and replaced them again, have done feats which to ante-diluvians would have appeared still less practicable, communicating with America as readily as with places five miles distant, propelling small islands of sinkable metal across the ocean, regardless of the star and despite the wind and current, without sail, and at continuous nearly race-horse speed, hurling projectiles almost akin to thunderbolts with unerring aim and invisible range—men who have brought science to such a pitch as this practically stand confessed of being either unable or unwilling to provide the collier, to whom more than to the man of any other class we are indebted and still dependent upon for our wealth as a nation, with a lamp whereby he may earn his bread in comparative safety. Let us, however, briefly revert to the first problem—that of ridding ourselves by means of improved ventilation of our insidious scourge. If, when the workings were first laid out, this gas had been considered in the light of an inferior enemy, always ready to take advantage of carelessness and neglect, yet as readily subservient and acknowledging man's superiority as the horse or the falcon, though as ready to escape as water through the gravel bed, or the chamois from the hunter, if only the means are afforded it. With all this ready agency anyone who will take the trouble to inspect the maps and sections of a few of the South Wales collieries will see that when those—it is a misnomer to call them plans—works were started their arrangement would tend to the opinion that the object in view was to retain the enemy in their power, and turn their workings thereby into a gasometer. By reference to some of those maps it will further be seen that in very many instances they have commenced with the air-pit at the top of the measures, as well as the winding-pit, the result being the air having to traverse down, round, and back again. Then, instead of remedying to a certain extent the first error by driving to the back of their limit and opening out from there, as soon as the pit is down they at once commence getting coal, in many instances so closely as to endanger the stability of the shaft itself; the consequence was that miles of otherwise unnecessary wind-roads were obliged to be kept open, forming of itself a most serious item of dead charge on the colliery. But more important to our present consideration, instead of leaving the "gough" or worked out portion behind all the time (as you draw from the boundary), with no air at back to force out your enemy upon you, by the faulty arrangement referred to, as you worked onward towards the boundary you had to provide for a greater supply of air to ventilate the worthless debris, which very supply of air was all that it required to render the locked-up gas powerful for mischief. Consequent thereon, you must always count upon the probability of your retreat being cut off by emissions from this mass of small coal and rubbish behind you. Neither is it altogether to be wondered at that masters have up to a recent period continued this manner of working, for it is very much to be questioned, if all their balance-sheets were brought forward (I speak of the South Wales coal field only) whether a scrutiny would not disclose as a fact that more money had been lost in those undertakings than had ever been gained (all contingencies considered) between Newport and Haverfordwest. It must be remembered also, in extenuation, that railroads were uncontemplated even, many localities well nigh isolated from machinery, and ironstone itself frequently carried in sacks over the mountains to the smelting-furnace miles away, and steam-boilers drawn by horses over mountain gullies, when water also, with such limited machine power, was considered more to be guarded against than fire, we can scarcely wonder at pits being commenced at the crop. At that time also there was less reliable information as to the geological construction of the basin itself, and they were ignorant how soon some up or down throw fault would put an end to their investment. I cannot speak to the most recent openings in the deeper and flatter measures, but with those exceptions, I know not one colliery which has its upcast and downcast pits in the right positions, and its workings arranged anticipatory of the necesities involved by extension, either as regards safety or economy. Shortness of capital by single individuals (before limited liability companies were started) was a most material drawback. As soon as the coal was reached some return must at once be brought in; capital was the bugbear. I have known more than one instance when the possession of a few thousands would not only have saved from ruin the proprietor but also made him a large return, the benefit of all of which was afterwards reaped at comparatively little toil or expense by his more fortunate successor. More open to censure have been the acts of the recent and intermediate proprietor in too many instances, instead of profiting by the, perhaps necessitated, short-sighted policy, and avoiding its continuance, they have been content with erecting fresh and expensive machinery, renovating the old shaft and air-pits, together with clearing up and enlarging the air-courses, at an expense frequently equal to that for which they might have sunk a new pit, brought all their coals down to it, left all old workings to ventilate themselves at the rear, and have gained dozens of acres of coal, now to be lost to them and their heirs for ever. Let us just for a few minutes entertain now the second proposition—that of rendering the so-called "safety-lamp" one in reality. Colliers delight in shooting, fishing, and gardening also, either for monster onions or dahlias, in proof of which latter during the life of the much-lamented Mrs. Augustus Morgan, of Machen Rectory, and her able coadjutor (now likewise dead) the Rev. Howell Williams, prizes were given for the best-kept gardens of Machen and the adjoining parishes, as also for the contents of those gardens; and whether the prize was for fruit, vegetables, or out-door grown flowers, no gardens of the neighbouring gentry could excel the collier growers. At that time I had a particularly good show of onions; and just a night or two before the Machen show someone paid my garden a visit, and carried off the finest of them. My gardener protested to having seen some of his cherished onions exhibited; but on enquiring what place they held in the ranks, I was glad to find, according to the grower's own account, that they were only worthy of a third prize. In mechanical knowledge the collier has little idea or delight; there are no spinning-jenny discoverers among them, or they would have effected before this an efficient light-holder for themselves, by which to work in safety. Is it impossible to construct a lamp with the following absolute essentials? And is it considered imperative to stick to the idea that a collier is only safe when working by means of wick and oil, and half the supply of light he might obtain through other agencies? Our present lamp, doubtless, shows a great deal of ingenuity; but I hope to see the day when it will be looked upon in the light we now regard the former appliance of flint and steel. I regret that I have only the capacity to advance a few practical suggestions to some more gifted and scientific mechanic, the difficulties to attaining which desideratum, if he surmount, not only a large fortune ought to reward, but also the blessings of women and children. Good light-giving properties, portability, strength of composition, and also arrangement to resist or render nugatory accidents either by fall of roof, casual smashes; or the most to be dreaded persistent recklessness of the collier, to whom long immunity from accident of any kind only acts as an incentive to further disregard and foolhardiness. I shudder now to contemplate acts done in the most cool manner underground when I was a boy, thought nothing of at the time or alluded to afterwards. I have been present when a collier to get a light for his pipe, after looking through the gauze to see what length of cap the flame carried, unscrew his lamp as unconcernedly as he afterwards peeled his onions to eat with his bread and cheese. Such as he was then, such he is now, and such he will be to the end; he is naturally brave and self-reliant, and all the repeated warnings are lost upon him; he argues because it happened to them, it is no reason it should happen to him. 'It never has happened, he is too good a judge of fire;' very well then, the lamp must be of such construction that the fact of unlocking or unscrewing, will not only be a tell-tale of his delinquency, and leave him till relieved in the dark, but also nullify his deed for ill by releasing the gas with which the lamp is proposed to be lighted as soon as the lock is turned. I would suggest, if it be possible, that the everyday burning-power of the lamp should be some four times less than what it could burn up to provided more gas were admitted to the flame, and that the ventillation of the lamp should cease after the admittance of a certain quantity of gas; and as a further safeguard, that by no possibility could an excess of gas be admitted through the apertures without affecting the ventilation of the lamp itself; or, if that were not feasible, construct the lamp so that the outside [illegible] may be regulated to the flame as safely as from a gas-pipe, and [illegible] the apertures to the flame to admit only such quantity of gas as was required for its own consumption. What would appear to me the most difficult of solution in its construction would be to arrange by means of an escape-valve, spring-cap, or some other contrivance for a sudden falling of roof, which would, perhaps, annihilate the poor man holding it, and at the same time expose the flame of the lamp to a 'bunch of gas' brought down with the fall. However, doubtless these same 'Sovereign Thrones,' when they have solved the other essentials, will not be long in effecting the remainder."

FOREIGN MINING AND METALLURGY.

The good tone of the French metallurgical markets has become more and more decided, and prices remain firm, several works having received proposals of orders to be executed next year. This state of things not only prevails in the Haute-Marne, but the Moselle has also numerous engagements for 1870, and these would be still more considerable if the forgemasters of the district showed any eagerness in the matter. It is the same with the department of the Nord, where one establishment is stated to have refused an order for nearly 5000 tons of a certain description of iron. Upon the whole, all articles continue in good general demand upon the French metallurgical markets. Rolled iron from coke-made pig has brought 8*l.* to 8*l.* 4s. per ton; mixed ditto, 8*l.* 12s. to 8*l.* 16s.; charcoal-made ditto, 9*l.* to 9*l.* 4s. per ton first-class. First-class sheets, coke-made, have brought 9*l.* 8s. per ton; and charcoal-made ditto, 9*l.* 16s. to 10*l.* per ton. Some special works quote sheets at 10*l.* 8s. per ton. The Jarville furnace, in the Meurthe, will shortly be re-lighted. A meeting of Champagne forgemasters, which was to have taken place on the 12th inst., has been countermanded, in consequence of a sale of Neufchâteau wood taking place on the same day; no fresh date has been indicated for the meeting. The imports into Paris in August of iron and castings for building purposes amounted to 5359 tons of iron and 1611 tons of castings; these figures show an increase, as compared with August, 1868, of 747 tons of iron and 62 tons of castings. In order to facilitate as much as possible the operations of merchants who have goods admitted temporarily on the warrant system, the Eastern of France Railway Company has agreed upon certain conditions to effect the Customs formalities, which have to be attended to. The Ahun Colliery Company is paying interest upon its obligations at the rate of 6*s.* per obligation. The Mokta-el-Hadid Magnetic Iron Minerals Company will pay 10*s.* per share in the shape of interest for the first half of 1869. This is an Algerian enterprise, and the payment will be made, Nov. 1, at the offices of the General Company for Promoting Commerce and Industry in France; the General Company has a considerable interest in the Mokta-el-Hadid undertaking. The Carmaux Works Company will pay a dividend of 8*s.* per share for the first half of 1869; this payment will be made on and after Nov. 2. The concern known as the Forges et Chantiers de la Méditerranée will pay on the same day a dividend on account for 1869, or 1*l.* 4s. per share.

As regards miscellaneous topics, we may note that the French Minister of Public Works is about to concede various new railway lines of the fourth network. The Great Russian Railway Company has taken possession of the Alexandrovsky Works, the direction of which has been entrusted to M. Rekhnevsky. The Berne International Conference, convened for the purpose of considering a scheme for a railway through the St. Gothard, has resolved to proceed with the undertaking. The Malfidano (Italy) Mines Company is paying interest for the current year, or 1*l.* per share. The Doehlen (near Dresden) Steel Works Company is paying a dividend at the rate of 15 per cent. per annum on the share capital for 1868-9.

The want of railway plant continues to be the great "pre-occupation" of the Belgian coal mining districts. Not only have coal-owners to complain of a scarcity of trucks on the State system, but the evil has now extended itself to the Eastern of France Railway and the Northern of France Railway, which are a good deal occupied at present with the conveyance of beetroot. Orders come to hand more urgently and more freely than ever, and all the collieries will soon be considerably in arrear. As regards deliveries on home account, it is impossible to effect them by means of the navigations, as canal-boats completely make default in the Charlerol basin, boat-owners having directed their attention to the collieries of the Centre, where they obtain advantageous freights for Antwerp, although much time is lost in waiting for their turn for loading. This state of things has been noticed for some time past at this season of the year, and it is to be regretted, since it produces high prices for the merchant or consumer, without benefitting in reality the boat-owner. It destroys the utility, to a great extent, of a number of the boats during a period of six weeks, as they only make one voyage instead of the two which they would be able to effect if they were loaded in the ordinary time. This want of railway trucks on the one hand, and of boats on the other, is a source of uneasiness as regards the future, and it is to be feared that if energetic measures are not taken to remedy the difficulty, many Belgian manufacturers will shortly be in want of combustible. All the local journals have raised a chorus of dolorous complaints, but at present these have remained without results. Some adjudications have taken place this week at Brussels for the purpose of supplying the wants of the Belgian State railway system. The first contract let comprised 100 coal wagons, of 10 tons each, and to be built entirely of iron; these were let to the Haine St. Pierre Company at 5992*l.* The highest tender (7080*l.*) was presented by the house of Thevenet, of Antwerp. The second contract comprised 45 open eight-wheel trucks, with articulated joints, to carry 20 tons each; these were let to the house of Ragheno, of Malines, at 5517*l.* The third and fourth lots comprised 380 truck-wheels; these were let to MM. Leroy and Co., at 2082*l.* for one lot, and 2085*l.* for the other. The fifth lot comprised 380 Bessemer steel axles, and was let to the Cockerill Company at 1992*l.*; an English house tendered unsuccessfully for this lot at 1650*l.* Another lot comprised 580 piston buffers for goods trucks, and was let to the Haine St. Pierre Company. Contracts for springs were let to the Cockerill Company and MM. Leroy and Co. The general aspect of the Belgian iron trade remains much the same. We may note, however, that some important contracts for rails have been proposed to the works forming the old syndicate; these contracts have not yet been negociated, but it is possible that they may come to something. The main source of the active demand which has prevailed for rails on the Continent for several months past is, as we have often taken occasion to observe, the great empire of the Czars. This will be more fully appreciated when we state that before the close of the current year ten lines now in course of construction will be brought into operation, their total length being 2562 verstes. Besides these, Russia is constructing 12 other new lines, of a total length of 3145 verstes. The most important of the ten lines to be opened this year are the Kiew and Balta, with branches to Woloczysk and Berdiczew 622 verstes in length; and the Charkoff and Azoff, 530 verstes in length.

There has not been much doing in copper at Havre, except for Chilian in bars, and prices have not revived; Chilian has realised 68*l.* 12s. to 68*l.* 16s., Paris conditions. Other marks have obtained only purely nominal quotations. United States (Baltimore) copper has completely made default. At Paris copper has been quoted by continuation at 68*l.* 12s. to 68*l.* 16s. per ton. At Marseilles, Toka, in warehouse, has brought 74*l.*; Spanish, 70*l.*, for consumption; and refined Chilian and Peruvian, 76*l.* These figures show an advance of 4s. per ton in Toka and Chilian. Rolled red copper for sheathing has made 82*l.* per ton at Marseilles, and yellow ditto 78*l.* per ton. There has been little or no animation in copper at Hamburg, and no change either has occurred upon the Dutch market. There is little to be said of the Paris tin market; upon the whole, prices would appear to be hardening. Banca has made 138*l.*, Straits 137*l.*, and English 124*l.* per ton. The German tin markets have not presented a better tone. At Rotterdam the tin market has been feeble, and some transactions have taken place in Banca at slightly lower rates; 72 fls. was paid in the case of about 1000 ingots, and as this very low rate had the effect of attracting purchasers, the market at the latest dates was somewhat firmer. At Amsterdam tin had descended also to 72 fls., but has since regained a quotation of 74 fls. The deliveries of Banca tin upon the Dutch markets during the past month were estimated at 18,000 ingots. The lead markets have not presented any important change; at Paris, French has made 19*l.* 4s. per ton, and Spanish, German, and Belgian have commanded a similar quotation. Zinc has exhibited considerable depression.

A petition for winding-up the Fenton Park Iron and Coal Company (Limited) is to be heard before Vice-Chancellor James on the first day of petitions in Michaelmas Term.

London: Printed by Richard Middleton, and published by Henry English (the proprietors), at their offices, 26, Fleet Street, E.C., where all communications are requested to be addressed.—*Oct.* 30, 1869.